

# Intensive Computation

7th march 2018

## Exercise 1

Write a script that:

- Create a matrix A n x n of random values
- Visualize the matrix A with command `imagesc` in the first subwindow of a grid 2x3
- Apply command `sort` to A and visualize the resulting matrix A1 with command `imagesc` in the next subwindow
- Apply command `reshape` to A1 to obtain a matrix with 2 rows, and visualize the resulting matrix AA with command `imagesc` in the next subwindow
- Repeat these 3 steps on B obtained as the transpose matrix of A
- Finally, **in a new window**, plot with different colours the 4 graphs obtained by using matrix AA and BB divided into two halves, and considering values in the first row of AA and BB as abscissas (reordered by command `sort`) and values in the second row as ordinates. Include the legend, the name of the axis and the name of the figure.

## Exercise 2

- Use `meshgrid` to obtain the 3-D representation of the functions:  
 $f(x,y) = x^6 + (ky)^6 * e^{(-x^2-(ky)^2)}$  where  $(x,y) \in [-2,2] \times [-2,2]$  and the scale grid is equal to 0,1
- Visualise the graph in different sub-windows for different values of k by using instructions `mesh`, `surf`, `surfl` and `contour`. For example, create a grid of 4 rows, each for a different plot command, and 3 columns for 3 different values of k.
- Try the command `getframe` and `movie` to create an animated sequence when the value of k varies.
- Plot also  $f(x,y) = \frac{2xy}{(x^2+y^2)}$  where  $(x,y) \in [1,3] \times [1,3]$  for different values of the grid scale.

## Exercise 3

Load an image .tif and an image .jpg

Write a function for each of the following filters:

- **GaussianFilter** – applied without considering the border using the kernel:  
$$\begin{matrix} 1 & 2 & 1 \\ 2 & 4 & 2 \\ 1 & 2 & 1 \end{matrix}$$
- **MeanFilter** – mean filter with a kernel 5x5 applied without considering the border
- **HighPassFilter** - applied without considering the border using the kernel:  
$$\begin{matrix} -1 & 0 & -1 \\ 0 & 5 & 0 \\ -1 & 0 & -1 \end{matrix}$$

Divide the image in four parts and apply a different filter to each part (for the image .jpg apply the filter to each plane) leaving the fourth unaltered.

Plot on two subwindows the original image and the filtered one.